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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :
STEVEN T. FINK : EXAMINER: CHANDRA, SATISH
SERIAL NO: 10/521,444 :
FILED: JANUARY 14, 2005 : GROUP ART UNIT: 1792
FOR: REDUCED VOLUME, HIGH :
CONDUCTANCE PROCESS CHAMBER

APPEAL BRIEF UNDER 37 C.F.R. §41.31

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

This is an appeal of the Rejection of Claims 56-70 in the Official Action of February 21, 2008. A Notice of Appeal was timely filed on May 21, 2008.

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is TOKYO ELECTRON LIMITED having address at 3-1, Akasaka 5-chrome, Minato-ku, Tokyo JAPAN 107-6325. (hereinafter Appellant).

II. RELATED APPEALS AND INTERFERENCES

Appellant, Appellant's legal representative, and the assignee are aware of no appeals or interferences which are related to, directly affect or be directly affected by, or have a bearing on the Board's decision in this appeal.

III. STATUS OF THE CLAIMS

Claims 56-70 are presently active in this case, Claims 1-55 having been canceled. Claims 56-70 have been twice rejected and form the basis for this appeal. The attached Claims Appendix includes a clean copy of Claims 56-70.

IV. STATUS OF THE AMENDMENTS

No Amendment was filed subsequent to the final rejection mailed on February 21, 2008.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

The present invention relates to process chambers used to process objects such as semiconductor wafers¹ and to a method of making an improved process chamber.² As explained in the Background of the Invention section, the process chamber is one of the most expensive components of integrated circuit fabrication machines used today.³ However, the present inventor has discovered a method of making an improved process chamber that can be reconfigured to provide a process chamber whose configurations can change to meet varying program or process goals for the chamber.⁴ Accordingly, a single process chamber

¹ Appellant's specification, at paragraph 2, 8, and 9 and in Figure 1.

² Appellant's specification, at paragraphs 8 and 9.

³ Appellant's specification, at paragraph 3.

⁴ Appellant's specification, at paragraph 31.

can replace a number of different chambers having different configurations, thereby providing the user with significant cost savings.⁵

Specifically, independent Claim 56 recites a method of making an improved vacuum processing apparatus, including providing a processing chamber which includes a lower wall, an upper wall, a side wall coupled to the lower wall and the upper wall, and a plurality of pumping ports, formed in one of the lower wall, the upper wall, or the side wall (Fig. 1; for example, paragraphs 22 and 27). The method further includes connecting a pumping cell, integrally including a vacuum pump and a valve, to a first pumping port (Fig. 1; for example, paragraph 27). Additionally, the method includes connecting a seal to a second pumping port such that the seal blocks a gas flow through the second pumping port (Figs. 3A-3D; for example, paragraph 29). The method also includes removing the pumping cell from the first pumping port and providing a substitute seal to the first pumping port such that the substitute seal blocks a gas flow through the first pumping port (Figs. 3A-3D; for example, paragraph 29). Additionally, the method includes removing the seal from the second pumping port and providing a substitute pumping cell to the second pumping port such that a gas flow through the vacuum processing apparatus is reconfigured by the providing the substitute seal to the first pumping port and the providing the substitute pumping cell to the second pumping port (Figs. 3A-3D; for example, paragraphs 29 and 31).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Claims 56, 62-66, and 68-70 are rejected under 35 U.S.C. §103(a) as being unpatentable over Komino (U.S. Patent 6,634,845) in view of Kawasaki et al. (U.S. Patent 6,382,249), Doan et al. (U.S. Patent 7,030,037), and Makino et al. (U.S. Patent 5,391,260), which is appealed.

⁵ Appellant's specification, at paragraphs 31 and 32.

B. Claims 57-59 are rejected under 35 U.S.C. §103(a) as being unpatentable over Komino in view of Kawasaki et al., Doan et al., and Makino et al., as discussed in Claims 56, 62-66, and 68-70 above, and further in view of Dandl et al. (U.S. Publication No. 2001/0016166) and van Os et al. (U.S. Patent 6,178,918), which is appealed.

C. Claim 67 is rejected under 35 U.S.C. §103(a) as being unpatentable over Komino in view of Kawasaki et al., Doan et al., and Makino et al., as discussed in Claims 56, 62-66, and 68-70 above, and further in view of Carducci et al. (U.S. Publication No. 2003/0038111), which is appealed.

D. Claims 60 and 61 are rejected under 35 U.S.C. §103(a) as being unpatentable over Komino in view of Kawasaki et al., Doan et al., and Makino et al., as discussed in Claims 56, 62-66, and 68-70 above, and further in view of Ishii (U.S. Patent 5,685,942), which is appealed.

VII. ARGUMENT

A. Claims 56, 62-66, and 68-70 Are Not Unpatentable Under 35 U.S.C. § 103(a) Over Komino in View of Kawasaki et al., Doan et al., and Makino et al.:

Appellant's Claim 56 recites:

A method of making an improved vacuum processing apparatus, comprising:

providing a processing chamber, including

a lower wall;

an upper wall;

a side wall coupled to the lower wall and the upper wall; and

a plurality of pumping ports, formed in one of the lower wall, the upper wall, or the side wall;

connecting a pumping cell, integrally including a vacuum pump and a valve, to a first pumping port;

connecting a seal to a second pumping port such that the seal blocks a gas flow through the second pumping port;

removing the pumping cell from the first pumping port and providing a substitute seal to the first pumping port such that the substitute seal blocks a gas flow through the first pumping port; and

removing the seal from the second pumping port and providing a substitute pumping cell to the second pumping port such that a gas flow through the vacuum processing apparatus is reconfigured by the providing the substitute seal to the first pumping port and the providing the substitute pumping cell to the second pumping port.

Accordingly, in the method of making an improved vacuum processing apparatus recited in Claim 56, pumping cells can be connected and removed from the pumping ports. Further, seals can also be connected and removed from the same pumping ports that can receive the pumping cells. Thus, by connecting and removing the pumping cells and the seals, a gas flow through the vacuum processing apparatus is reconfigured.

Komino describes a process chamber PC that includes pumps 88 and valves 89.⁶

Komino also describes that, when one of the pumps 88 fails, the corresponding valve 89 can be closed and the failed pump 88 can be removed.⁷ Accordingly, in the process chamber PC described in Komino, if the valve 89 is removed, then the process chamber PC is no longer sealed.

The Office Action, on page 3, concedes that Komino does not disclose “at least one pumping cell, integrally including a pump and a valve, coupled to a first pumping port.” Instead, the Office Action relies on Kawasaki et al. to cure this deficiency of Komino.

⁶ See Komino, at col. 15, lines 19-31 and Figure 17.

⁷ See Komino, at col. 17, lines 9-34.

Kawasaki et al. describes a turbo-vacuum pump including a valve element 62 and a valve drive mechanism 64.⁸ Kawasaki et al. also describes that the valve drive mechanism 64 is provided integrally with the pump body.⁹

The Office Action takes the position that “it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the pumping cell of Komino et al with the integrated pump and valve assembly of Kawasaki et al in the apparatus of Komino et al.”¹⁰ However, if the pumping cell (pump 88 and valve 89) of Komino is integrated, then removing the pumping cell from the process chamber PC would leave an unsealed pumping port. Further, it is respectfully submitted that Komino and Kawasaki et al. do not disclose or suggest providing a substitute seal to a pumping port from which an integrated pumping cell has been removed.

Thus, it is respectfully submitted that the combination of Komino and Kawasaki et al. does not disclose or suggest “removing the pumping cell from the first pumping port and providing a substitute seal to the first pumping port such that the substitute seal blocks a gas flow through the first pumping port,” as recited in Claim 56.

The Office Action, on pages 4 and 5, concedes that the combination of Komino, Kawasaki et al., and Doan et al. does not disclose or suggest “when the seal is removed from the second pumping port and a substitute pumping cell is provided to the second pumping port such that a gas flow through the vacuum processing apparatus is reconfigured by providing the substitute seal to the first pumping port and providing the substitute pumping cell to the second pumping port.” Instead, the Office Action relies on Makino et al. to cure

⁸ See Kawasaki et al., at col. 9, lines 4-8 and in Figure 9.

⁹ See Kawasaki et al., at col. 9, lines 8 and 9.

¹⁰ See the Office Action, at page 3.

this deficiency of Komino, Kawasaki et al., and Doan et al. Specifically, the Office Action relies on the modified embodiment described at lines 1-6, on column 6 of Makino et al.¹¹

Makino et al. describes a third preferred embodiment in which a process chamber 10 includes a single exhaust pump 18 on a lower side wall of the process chamber 10.¹² In the portion of Makino et al. cited in the Office Action, Makino et al. describes a modification of the third embodiment in which the process chamber 10 includes a pair of exhaust pumps 42, instead of the single exhaust pump 18, provided on lower side walls of the process chamber 10.¹³

However, it is respectfully submitted that Makino et al. does not disclose or suggest “removing the seal from the second pumping port and providing a substitute pumping cell to the second pumping port such that a gas flow through the vacuum processing apparatus is reconfigured by the providing the substitute seal to the first pumping port and the providing the substitute pumping cell to the second pumping port,” as recited in Claim 56.

Instead, it is respectfully submitted that the modification described in Makino et al. is not a *reconfiguration* of a vacuum processing apparatus, but is another example of an apparatus that has a pair of exhaust pumps 42. This is evidenced by the fact that the single exhaust pump shown in Figure 6 of Makino et al. is labeled as 18 and that each of the pair of exhaust pumps shown in Figure 7 of Makino et al. is labeled as 42. Thus, the portion of Makino et al. cited in the Office Action does not describe reconfiguring the process chamber 10 shown in Figure 6 to include another exhaust pump, but instead describes another example of a process chamber 10 that includes different components from the process chamber 10 shown in Figure 6.

¹¹ See the Office Action, at page 5.

¹² See Makino et al., at col. 5, lines 28-66 and in Figure 6.

¹³ See Makino et al., at col. 5, line 66 to col. 6, line 6 and in Figure 7.

Additionally, it is noted that the pair of exhaust pumps 42 in Makino et al. were not added to a pumping port from which a seal was removed. Further, Makino et al. does not disclose or suggest that the apparatus can be reconfigured such that a seal is provided in place of one of the pair of exhaust pumps 42. Thus, Makino et al. does not describe a *reconfiguring an apparatus*, but instead describes a number of different apparatuses that each have a different configuration.

Appellant notes that Doan et al. was cited in the Office Action in rejecting Claim 70, and was not cited in rejecting Claim 56. Further, it is respectfully submitted that Doan et al. does not cure the above-noted deficiencies of Komino, Kawasaki et al., and Makino et al.

Doan et al. describes a deposition apparatus 10 including pressure control valving and an isolating valve 42 that isolate one of the pumps 26, 28 from the chamber 12 during operation.¹⁴

However, it is respectfully submitted that Doan et al. does not disclose or suggest “removing the pumping cell from the first pumping port and providing a substitute seal to the first pumping port such that the substitute seal blocks a gas flow through the first pumping port,” as recited in Claim 56.

Instead, Doan et al. describes that one of the pumps 26, 28 can be isolated from the chamber 12 by the valves. Doan et al. does not describe that one of the pumps 26, 28 is removed from a pumping port after the pump 26, 28 is isolated. Additionally, Doan et al. does not disclose or suggest that these valves would effectively seal the port where the pump 26, 28 was located when the pump 26, 28 is removed from the port. Thus, it is respectfully submitted that the valves described in Doan et al. are not the claimed seals.

¹⁴ See Doan, at col. 3, line 57 to col. 4, line 24 and in Figure 2.

Therefore, for the reasons discussed above, it is respectfully submitted that Claim 56 is not unpatentable under 35 U.S.C. § 103(a) over Komino in view of Kawasaki et al., Doan et al., and Makino et al.

Regarding Claims 62-66 and 68-70, it is noted that these claims are dependent on Claim 56 and are believed to be patentable for at least the reasons discussed above with respect to Claim 56.

Further, regarding Claims 68 and 69, it is noted that the Office Action does not state where the limitations recited in Claims 68 and 69 can be found in the cited references. Thus, the Office Action does not clearly articulate the reasons why the invention recited in Claims 68 and 69 would have been obvious. Accordingly, it is respectfully submitted that a *prima facie* case of obviousness has not been made with respect to Claims 68 and 69.

Accordingly, for at least the reasons discussed above, it is respectfully submitted that Claim 62-66 and 68-70 are not unpatentable under 35 U.S.C. § 103(a) over Komino in view of Kawasaki et al., Doan et al., and Makino et al.

B. Claims 57-59 Are Not Unpatentable Under 35 U.S.C. § 103(a) Over Komino in View of Kawasaki et al., Doan et al., and Makino et al. as Discussed in Claims 56, 62-66, and 68-70 Above, and Further in View of Dandl et al. and van Os et al.:

The Office Action relies on Komino, Kawasaki et al., Doan et al., and Makino et al. for teaching all of the limitations in independent Claim 56, and cites the secondary references (Dandl et al. and van Os et al.) only for teachings of dependent Claims 57-59. However, it is respectfully submitted that Dandl et al. and van Os et al. do not teach the limitations of Claim 56 as discussed in Section VII.A of this Brief. Therefore, the rejection of Claims 57-59 under 35 U.S.C. §103(a) is also improper and should be withdrawn.

C. Claim 67 Is Not Unpatentable Under 35 U.S.C. § 103(a) Over Komino in View of Kawasaki et al., Doan et al., and Makino et al. as Discussed in Claims 56, 62-66, and 68-70 Above, and Further in View of Carducci et al.:

The Office Action relies on Komino, Kawasaki et al., Doan et al., and Makino et al. for teaching all of the limitations in independent Claim 56, and cites the secondary reference (Carducci et al.) only for teachings of dependent Claim 67. However, it is respectfully submitted that Carducci et al. does not teach the limitations of Claim 56 as discussed in Section VII.A of this Brief. Therefore, the rejection of Claim 67 under 35 U.S.C. §103(a) is also improper and should be withdrawn.

D. Claims 60 and 61 Are Not Unpatentable Under 35 U.S.C. § 103(a) Over Komino in View of Kawasaki et al., Doan et al., and Makino et al. as Discussed in Claims 56, 62-66, and 68-70 Above, and Further in View of Ishii:

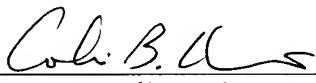
The Office Action relies on Komino, Kawasaki et al., Doan et al., and Makino et al. for teaching all of the limitations in independent Claim 56, and cites the secondary reference (Ishii) only for teachings of dependent Claims 60 and 61. However, it is respectfully submitted that Ishii does not teach the limitations of Claim 56 as discussed in Section VII.A of this Brief. Therefore, the rejection of Claims 60 and 61 under 35 U.S.C. §103(a) is also improper and should be withdrawn.

E. Conclusion

For the reasons discussed above, the rejection of Claims 56-70 is improper and should be withdrawn.

Respectfully submitted,

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VIII. CLAIMS APPENDIX

Claim 56: A method of making an improved vacuum processing apparatus, comprising:

providing a processing chamber, including

a lower wall;

an upper wall;

a side wall coupled to the lower wall and the upper wall; and

a plurality of pumping ports, formed in one of the lower wall, the upper wall,

or the side wall;

connecting a pumping cell, integrally including a vacuum pump and a valve, to a first pumping port;

connecting a seal to a second pumping port such that the seal blocks a gas flow through the second pumping port;

removing the pumping cell from the first pumping port and providing a substitute seal to the first pumping port such that the substitute seal blocks a gas flow through the first pumping port; and

removing the seal from the second pumping port and providing a substitute pumping cell to the second pumping port such that a gas flow through the vacuum processing apparatus is reconfigured by the providing the substitute seal to the first pumping port and the providing the substitute pumping cell to the second pumping port.

Claim 57: The method according to claim 56, further comprising:

making the side wall with a height of at most about four inches.

Claim 58: The method according to claim 57, further comprising:

making the process chamber of plate stock with a thickness of about four inches.

Claim 59: The method according to claim 58, wherein the plate stock is aluminum.

Claim 60: The method according to claim 57, further comprising:

making the process chamber via a molding process.

Claim 61: The method according to claim 57, wherein
said lower wall is a plate and said side wall is a rolled cylinder, and
the making the process chamber includes welding the lower wall to the side wall.

Claim 62: The method according to claim 57, further comprising:
providing the plurality of pumping ports on the lower wall of the process chamber
adjacent to a process chamber volume.

Claim 63: The method according to claim 57, further comprising:
providing a chuck assembly in the process chamber; and
providing three pumping ports on the lower wall of the process chamber
symmetrically spaced about the chuck assembly.

Claim 64: The method according to claim 63, further comprising:
connecting three pumping cells to the process chamber,
wherein each one of the three pumping cells are connected to a respective one of the
three pumping ports and the three pumping ports being configured to receive said substitute
seal in order to reconfigure the gas flow in the vacuum processing apparatus.

Claim 65: The method according to claim 57, further comprising:
providing a chuck assembly in the process chamber; and
providing two pumping ports on the lower wall of the process chamber symmetrically spaced about the chuck assembly on opposing sides thereof.

Claim 66: The method according to claim 65, further comprising:
connecting two pumping cells to the process chamber,
wherein each one of the two pumping cells are connected to a respective one of the two pumping ports and the two pumping ports being configured to receive said substitute seal in order to reconfigure the gas flow in the vacuum processing apparatus.

Claim 67: The method according to claim 56, further comprising:
providing a chamber liner in the process chamber configured to displace open volume within the process chamber.

Claim 68: The method according to claim 56, further comprising:
providing an upper electrode to facilitate the formation of plasma in the process chamber.

Claim 69: The method according to claim 56, wherein
the substitute seal provided to the first pumping port is the seal removed from the second pumping port, and
the substitute pumping cell provided to the second pumping port is the pumping cell removed from the first pumping port.

Claim 70: The method according to claim 56, wherein the removing the seal from the second pumping port includes removing the seal such that the seal does not contact the lower wall, the upper wall, or the side wall.

IX. EVIDENCE APPENDIX

(NONE)

X. RELATED PROCEEDINGS APPENDIX

(NONE)